

Appln. Serial No. 10/074,799  
Supplemental Amendment

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions, and listings, of claims in the application:

1. (Cancelled)

2. (Currently Amended) ~~The method of claim 1:~~ A method of distributing workload in a workflow management system comprising the steps of:  
during a calibration mode, executing plural instantiations of a test process to identify load index parameters;  
calculating a load index based on the load index parameters for each of a plurality of engines of the workflow management system, wherein each load index reflects a workload of its associated engine, wherein the load index corresponds to an average activity execution delay;  
and  
distributing workload across the plurality of engines in response to the load indices in a load sensitive mode,  
wherein identifying the load index parameters comprises identifying a single engine nominal activity execution delay (C) when no concurrent activities are executing and an activity execution latency factor ( $\lambda$ ), wherein  $\lambda$  is a function of a number of concurrently executing activities.

3. (Previously Presented) The method of claim 2 wherein calculating the load index comprises calculating the load index for each engine  $j$  as a total average activity execution delay  
$$L(j) = C + \frac{1}{k} \sum_{i=1}^k N_i \lambda_i$$
  
wherein  $k$  is a total number of activities completed within a pre-determined time period for engine  $j$ , wherein  $N_i$  is the number of other concurrently executing processes at the time activity  $i$  is executing, wherein  $\lambda_i$  is an execution latency rate for activity  $i$ .

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- 1 4. (Previously Presented) The method of claim 2 wherein calculating the load index  
2 comprises calculating the load index for each engine  $j$  as a relative average activity execution  
3 delay  $L(j) = \frac{1}{k} \sum_{i=1}^k N_i \lambda_i$ , wherein  $k$  is a total number of activities completed within a pre-  
4 determined time period for engine  $j$ , wherein  $N_i$  is the number of other concurrently executing  
5 activities at the time activity  $i$  is executing, wherein  $\lambda_i$  is an execution latency rate for activity  $i$ .
- 1 5. (Currently Amended) The method of claim [[1]] 2 wherein distributing the workload  
2 comprises re-directing incoming process requests to another engine.
- 1 6. (Currently Amended) The method of claim [[1]] 2 wherein distributing the workload  
2 comprises re-distributing queued processes to another engine.
- 1 7. (Currently Amended) The method of claim [[1]] 2 wherein distributing the workload  
2 comprises prioritizing a source engine for distributing workload from based on a maximum  
3 differential workload.
- 1 8. (Currently Amended) The method of claim [[1]] 2 wherein distributing the workload  
2 comprises identifying a target engine to which workload is to be distributed based on a  
3 maximum differential workload.

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1 9. (Currently Amended) A method of distributing workload in a workflow management  
2 system comprising the steps of:  
3 a) calculating a load index for each engine of the workflow management system,  
4 wherein each load index reflects a workload of its associated engine;  
5 b) operating in a load insensitive workload distribution mode for distributing  
6 processes among the engines in a first distribution fashion that is insensitive to the load indices  
7 until a maximum differential load index exceeds a pre-determined threshold; and  
8 c) operating in a load sensitive workload distribution mode for distributing processes  
9 among the engines in a second distribution fashion that is sensitive to the load indices until all  
10 processes have completed execution once the maximum differential load index exceeds the pre-  
11 determined threshold.

1 10. (Original) The method of claim 9 wherein processes are round-robin distributed in the  
2 load insensitive workload distribution mode.

1 11. (Original) The method of claim 9 wherein step a) further comprises the step of  
2 calculating the load index for each engine  $j$  as a total average activity execution delay  
3  $L(j) = C + \frac{1}{k} \sum_{i=1}^k N_i \lambda_i$ , wherein  $k$  is a total number of activities completed within a  
4 pre-determined time period for engine  $j$ , wherein  $N_i$  is the number of other concurrently  
5 executing processes at the time activity  $i$  is executing, wherein  $\lambda_i$  is an execution latency rate for  
6 activity  $i$ , wherein  $C$  is a single engine nominal activity execution delay when no concurrent  
7 activities are executing.

1 12. (Original) The method of claim 9 wherein step a) further comprises the step of  
2 calculating the load index for each engine  $j$  as a relative average activity execution delay  
3  $L(j) = \frac{1}{k} \sum_{i=1}^k N_i \lambda_i$ , wherein  $k$  is a total number of activities completed within a pre-determined  
4 time period for engine  $j$ , wherein  $N_i$  is the number of other concurrently executing activities at  
5 the time activity  $i$  is executing, wherein  $\lambda_i$  is an execution latency rate for activity  $i$ .

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- 1 13. (Original) The method of claim 9 wherein step c) further comprises the step of  
2 re-directing incoming process requests to another engine.
- 1 14. (Original) The method of claim 9 wherein step c) further comprises the step of  
2 re-distributing queued processes to another engine.
- 1 15. (Original) The method of claim 9 wherein step c) further comprises the step of  
2 prioritizing a source engine for distributing workload from based on a maximum differential  
3 workload.
- 1 16. (Original) The method of claim 9 wherein step c) further comprises the step of  
2 identifying a target engine for distributing workload to based on a maximum differential  
3 workload.
- 1 17. (Currently Amended) A method of distributing workload in a workflow management  
2 system comprising the steps of:  
3 calculating a load index for each engine of the workflow management system, wherein  
4 each load index reflects a workload of its associated engine;  
5 [[a]] switching from a load insensitive workload distribution mode to a load sensitive  
6 workload distribution mode for distributing processes among the engines in a first distribution  
7 fashion that is sensitive to the load indices when a maximum differential load index exceeds a  
8 first pre-determined threshold, T1; and  
9 [[b]] switching from the load sensitive workload distribution mode to the load  
10 insensitive workload distribution mode for distributing processes among the engines in a second  
11 distribution fashion that is insensitive to the load indices when the maximum differential load  
12 index is less than a second pre-determined threshold, T2.
- 1 18. (Previously Presented) The method of claim 17 wherein  $T1=T2$ .
- 1 19. (Previously Presented) The method of claim 17 wherein  $T1>T2$ .

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1 20. (Currently Amended) The method of claim 17 wherein ~~step a) further comprises the step~~  
2 ~~of calculating a~~ the load index for each engine  $j$  is calculated as a total average activity execution

3 delay  $L(j) = C + \frac{1}{k} \sum_{i=1}^k N_i \lambda_i$ , wherein  $k$  is a total number of activities completed within a  
4 pre-determined time period for engine  $j$ , wherein  $N_i$  is the number of other concurrently  
5 executing processes at the time activity  $i$  is executing, wherein  $\lambda_i$  is an execution latency rate for  
6 activity  $i$ , wherein  $C$  is a single engine activity nominal execution delay when no concurrent  
7 activities are executing.

1 21. (Currently Amended) The method of claim 17 wherein ~~step a) further comprises the step~~  
2 ~~of calculating a~~ the load index for each engine  $j$  is calculated as a relative average activity

3 execution delay  $L(j) = \frac{1}{k} \sum_{i=1}^k N_i \lambda_i$ , wherein  $k$  is a total number of activities completed within a  
4 pre-determined time period for engine  $j$ , wherein  $N_i$  is the number of other concurrently  
5 executing activities at the time activity  $i$  is executing, wherein  $\lambda_i$  is an execution latency rate for  
6 activity  $i$ .

1 22. (Currently Amended) ~~The method of claim 1, further comprising~~ A method of  
2 distributing workload in a workflow management system comprising the steps of:  
3 during a calibration mode, executing plural instantiations of a test process to identify load  
4 index parameters;

5 calculating a load index based on the load index parameters for each of a plurality of  
6 engines of the workflow management system, wherein each load index reflects a workload of its  
7 associated engine, wherein the load index corresponds to an average activity execution delay;  
8 distributing workload across the plurality of engines in response to the load indices in a  
9 load sensitive mode; and

10 providing a definition of activities in the test process such that for each activity, a  
11 resource execution time is much less than an engine execution time, the resource execution time  
12 representing an execution time of a resource to perform work represented by the respective  
13 activity, and the engine execution time representing an execution time of the respective engine in  
14 performing the activity.

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1 23. (Previously Presented) A workflow management system, comprising:  
2 plural workflow engines;  
3 workload monitors to compute load indices for the workflow engines, wherein each load  
4 index reflects a workload of the corresponding workflow engine; and  
5 a load balancer to:  
6 operate in a load insensitive workload distribution mode for distributing processes  
7 among the workflow engines in a first distribution fashion that is insensitive to the load indices  
8 until at least one difference between load indices of the workflow engines exceeds a first  
9 threshold; and  
10 after the at least one difference between load indices exceeds the first threshold,  
11 operate in a load sensitive workload distribution mode for distributing processes among the  
12 workflow engines in a second distribution fashion that is sensitive to the load indices until at  
13 least one of:  
14 (1) all processes have completed execution; and  
15 (2) the at least one difference between load indices of the workflow  
16 engines is less than a second threshold.

1 24. (Previously Presented) The workflow management system of claim 23, wherein the load  
2 index for each engine  $j$  is a total average activity execution delay  $L(j) = C + \frac{1}{k} \sum_{i=1}^k N_i \lambda_i$ , wherein  
3  $k$  is a total number of activities completed within a pre-determined time period for engine  $j$ ,  
4 wherein  $N_i$  is the number of other concurrently executing processes at the time activity  $i$  is  
5 executing, wherein  $\lambda_i$  is an execution latency rate for activity  $i$ , wherein  $C$  is a single engine  
6 activity nominal execution delay when no concurrent activities are executing.

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1 25. (Previously Presented) The workflow management system of claim 23, wherein the load  
2 index for each engine  $j$  is a relative average activity execution delay  $L(j) = \frac{1}{k} \sum_{i=1}^k N_i \lambda_i$ , wherein  $k$   
3 is a total number of activities completed within a pre-determined time period for engine  $j$ ,  
4 wherein  $N_i$  is the number of other concurrently executing activities at the time activity  $i$  is  
5 executing, wherein  $\lambda_i$  is an execution latency rate for activity  $i$ .

1 26. (Currently Amended) The method of claim [[1]] 2, wherein the plural instantiations of  
2 the test process are executed during the calibration mode to increase loading on each workflow  
3 engine to enable identification of the load index parameters.